CLEANING DEVICE FOR SMOOTH FLOOR SURFACES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a cleaning device for floor surfaces, in particular, for smooth floor surfaces such as wood, parquet, tile, stone, linoleum or the like, comprising a housing in which a working chamber and a drive chamber are formed wherein a cleaning roller is rotatably supported in the working chamber and extends transversely to the working direction of the cleaning device substantially across the entire width of the cleaning device. The cleaning roller is driven by a drive arranged in the drive chamber about a horizontal axis of rotation wherein the mantle surface of the cleaning roller in the working position projects past the bottom plate of the housing.

2. Description of the Related Art

Cleaning devices in the form of a vacuum cleaning tool are known in many embodiments. A configuration which has penetrated the market is a vacuum cleaning tool in which a brush roller, arranged transversely to the working direction in a brush chamber, is rotatingly driven and acts on the floor surface to be cleaned. A suction airflow which is guided at the same time through the brush chamber entrains the dirt particles which have been loosened by the brush roller from the floor surface and transports them into a dust collection container.

Such a vacuum cleaning tool is only partially suitable for cleaning smooth floor surfaces. For this reason, switching devices are provided which set the brush roller inoperative in order to simply vacuum smooth floor surfaces.

SUMMARY OF THE INVENTION

It is an object of the present invention to further develop a cleaning device of the aforementioned kind such that cleaning of a smooth floor surface is possible in a simple way.

In accordance with the present invention, this is achieved in that at least one additional, or second, cleaning roller is supported in the working chamber which extends substantially adjacent to the first cleaning roller and is rotatingly driven about a horizontal axis of rotation, wherein the cleaning rollers are secured to be height-adjustable in the housing, and wherein the cleaning rollers can be moved into a working position or into a parking position by means of an adjusting device.

By means of cleaning rollers that are arranged in a switchable way in the cleaning device, it is possible for the user to position, depending on the type of floor covering and the degree of soiling, a cleaning roller suitable for the work to be carried out in the working position. For example, when a first cleaning roller is used as a polishing roller, another - second - cleaning roller can be used as a loosening tool for removing heavy soiling or a third cleaning roller of reduced aggressiveness can be activated additionally. When heavy soiling that is difficult to remove is present, the user switches to the second cleaning roller and works with it. When

the dirt has been substantially loosened and removed, switching to the third cleaning roller enables a final cleaning action and switching to the first cleaning roller enables a polishing action of the cleaned surface.

It may be expedient to bring two cleaning rollers simultaneously into their working positions. In this arrangement, the forward or leading cleaning roller could be used for removing heavy soiling and the rearward cleaning roller could be configured for polishing.

Switching from one cleaning roller to the other cleaning roller is expediently realized by an adjusting device in the form of a change-over switch. In a constructively simple configuration, the cleaning rollers are secured on a common support for this purpose which support is mounted in the housing especially such that it is pivotable about a horizontal pivot axis. Accordingly, the adjusting device acts to pivot the support in order to bring one and/or the other cleaning roller into the working position. Several cleaning rollers can be distributed in an arrangement similar to a revolver cylinder about the pivot axis and can be individually or commonly positioned in their working positions by rotation about the pivot axis.

A different cleaning action can be achieved also when the rotational speed of the cleaning rollers is configured to be different. This is possible in a simple way by drive wheels of different sizes. For example, in the case of a belt drive, the desired rotational speed of the cleaning roller can be constructively predetermined by selecting the diameter of the pulley.

In a special configuration of the invention, or completely separate therefrom, a coupling module in the form of a separate component is provided for connecting the cleaning roller with the drive. The coupling module is expediently configured as a unitary part together with the drive wheel of the drive and engages with coupling elements fixedly, but detachably, the end face on the driven end of the cleaning roller. In order to provide a crude dust-tight separation between the working chamber with the cleaning rollers and the drive chamber with the drive wheels, a cover disc, arranged in the working chamber, is provided between the drive wheel and the driven end of the cleaning roller. Arranged in the working chamber, it covers the penetration in the partition between the working chamber and the drive chamber.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

Fig. 1 is a perspective view of a cleaning device with a suction connector for a vacuum cleaning device;

Fig. 2 is a perspective view onto the cleaning device according to Fig. 1 with removed forward housing cover;

Fig. 3 is a perspective view of the cleaning device according to Fig. 2 with removed upper housing part;

Fig. 4 is a perspective view of the cleaning device from the rear;

Fig. 5 is a plan view of the cleaning rollers of the cleaning device according

to the invention;

Fig. 6 is a schematic illustration of the cleaning rollers of the cleaning device with the forward cleaning roller in the working position and the rearward cleaning roller in the parking position;

Fig. 7 is a perspective illustration according to Fig. 6 with the forward cleaning roller in the parking position and the rearward cleaning roller in the working position;

Fig. 8 is a sectional view of the working chamber and the suction slot;

Fig. 9 is a perspective detail view of the bearing arrangement for a cleaning roller;

Fig. 10 is a perspective detail view of a coupling module rotatingly driven by the drive;

Fig. 11 is a view of the cleaning roller with coupling module inserted at the drive side;

Fig. 12 is a perspective view of the driven end of the cleaning roller with detached coupling module; and

Fig. 13 is a plan view onto the end face of the driven side of the cleaning roller.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The illustrated cleaning device is provided for cleaning floor surfaces such as smooth floor surfaces with coverings of wood, parquet, tile, stone, linoleum or the

like. The cleaning device 1 is comprised substantially of a tub-shaped lower housing part 2 which is covered over a portion thereof by an upper housing part 3. The upper housing part 3 closes the lower housing part 2 with the exception of a working chamber 5 positioned in front in the working direction 4. The working chamber 5 is closed by a cover 6 that is separate from the remaining housing 1. The cover 6 is secured in an easily detachable way by means of tongues 7 on the lower housing part 2 and is captively suspended in slots 8 on the upper housing part 3.

As illustrated particularly in Figs. 4 and 5, the working chamber 5, arranged at the front in the working direction 4, extends substantially over the entire width of the housing 1, wherein cleaning rollers 10 and 20 - two in the illustrated embodiment - are positioned in the working chamber 5. The two cleaning rollers 10 and 20 extend substantially across the entire width of the housing 1 transversely to the working direction 4 and are secured adjacent to one another on a support 9. The common support 9 for the cleaning rollers 10, 20 is comprised in the illustrated embodiment substantially of a central support beam 11 having at its ends a transverse support 12, respectively. The support beam 11 and the transverse supports 12 are preferably manufactured as a unitary part, for example, of plastic material, wherein the ends of the support beam 11 are substantially T-shaped as a result of the presence of the transverse supports 12. The transverse beams 12, which are configured especially like a leaf spring, secure a cleaning roller 10, 20

between their free ends 13, 14 in an easily exchangeable way. The ends of the cleaning rollers are secured such that their longitudinal center axis define their axis of rotation, respectively. The two adjacently positioned cleaning rollers 10, 20 are rotatingly driven about their horizontal axis of rotation 15, 25 by a drive which in the illustrated embodiment is an electric motor 16. As shown in Figs. 3 to 5, the drive motor 16 is positioned in a drive chamber 17 which is completely separate from the other housing areas, in particular, from the working chamber 5. The shaft 18 of the drive motor 16 extends substantially parallel to the axes of rotation 15 and 25 and supports at one end a pulley 19 of a belt drive 30 which is received in a substantially dust-free lateral drive chamber or belt chamber 31 of the housing 1. The belt 32 of the belt drive 30 cooperates with a pulley 33 which is connected fixedly with the cleaning roller 20. A second pulley 34 is fixedly connected with the first pulley 33, and a belt 36 is positioned on the second pulley 34 and extends about the pulley 34a of the forward first cleaning roller 10. The cleaning rollers 10 and 20, which are positioned in the working direction 4 behind one another, are thus commonly driven in rotation by the drive 16 wherein one - the rearward - cleaning roller 20 is directly connected with the drive 16 while the other - the forward - cleaning roller 10 is driven via the belt 36 by the rearward cleaning roller 20. The belts 32, 36 can be flat belts, V-belts or toothed belts. It can be advantageous to employ a drive connection in the form of a gearwheel drive instead of the drive connection in the form of belt drives; a combination of the both is also possible.

The common support 9 of the cleaning rollers 10 and 20 is pivotably supported about a horizontal pivot axis 29 in the working chamber 5 in the lower housing part 2. For realizing the pivot action, an adjusting lever 21 projects from the support beam 11, which is, for example, of a lattice configuration, in the direction toward the cover 6. As illustrated in Fig. 1, the adjusting lever 21 projects through a slot 22 in the cover 6. Preferably, the adjusting lever 21 can snap into place in the slot 22 in one end position as well as in the other end position so that the one or the other pivot position of the support 9 is stably secured. Advantageously, the cleaning roller resting on the floor surface is pushed against the floor surface by means of a spring or the like in a springy fashion so that tolerances can be compensated and a contact pressure is provided.

The adjusting lever 21 forms together with the slot 22 and the support 9 an adjusting device with which the cleaning rollers 10 and 20 are height-adjustably secured in the housing. In the position illustrated in Fig. 1, the forward cleaning roller 10, corresponding to the schematic illustration in Fig. 6, projects with its mantle surface 23 past the bottom plate 24 of the housing 1. In this position, the cleaning roller 10 can act on the floor surface to be cleaned. The cleaning roller 10 is in its working position.

Corresponding to the working position in Fig. 6 and the arrangement on the common support 9, the other cleaning roller 20 is lifted off the floor as a result of pivoting of the support 9 about the pivot axis 29. The rearward cleaning roller 20

is thus positioned at a spacing from the bottom plate 24 in a parking position in which it is disengaged from the floor surface to be cleaned.

When the adjusting lever 21 is moved counter to the working direction 4 to the rear, it reaches the position according to Fig. 7. In this position, the forward cleaning roller 10 is lifted off the floor surface to be cleaned. Its mantle surface 23 can no longer act on the floor surface. As a result of the pivot movement about the pivot axis 29 and the arrangement on the transverse supports 12, the mantle surface 26 of the rearward cleaning roller 20 now projects past the bottom plate 24 and can act on the floor surface to be cleaned.

Preferably, the support 9 is provided at its ends with bearing stumps 27 engaging corresponding bearing openings in the sidewalls of the lower housing part 2 so that a simple configuration is provided. Since the cover 6, when removed, opens the entire working chamber area, the belt drives 30, 37 are also exposed so that malfunctions as a result of picked-up dirt or lint or the like can be easily eliminated. Moreover, as a result of opening the entire working chamber 5 after removal of the cover 6, an easy exchange of the cleaning rollers 10 and 20 is possible. As illustrated in Fig. 7, the forward cleaning roller 10, when in its parking position, is lifted partially out of the working chamber 5 so that for demounting only the leaf spring-like transverse supports 12 are to be bent open slightly. The bearing pins (56, 76) of the axes of rotation 15 and 25, which are secured on the ends 13 and 14 of the transverse supports 12, are released in this way, and the cleaning

rollers 10 and 20 can be easily lifted in the upward direction out of the housing.

The cleaning rollers 10 and 20 have a cleaning mantle 40 and 41, respectively, which is slipped, for example, like a hose, onto the base body of the cleaning roller or is secured on the base body like a bandage or wrap. Advantageously, several layers or coatings 64 of material (Fig. 13) are secured on the cylindrical base member of the cleaning roller which can be removed layer by layer, for example, by tearing them off. In this way, a new, unused layer is always provided for cleaning the floor surface. The outer diameter, which is reduced over the course of operation of the device, is compensated as a result of the springy contact on the floor surface.

The cleaning mantle can also be a brush arrangement, as is illustrated in Fig. 6 by means of bristles 28. Advantageously, it is comprised of textile material, a nonwoven material, or woven or knit material or the like. Preferably, the cleaning mantle 40 of the forward cleaning roller 10 is comprised of a material of different structure, hardness, configuration or aggressiveness in comparison to the cleaning mantle 41 of the rearward cleaning roller 20. For example, the forward cleaning roller 10 can have a hard abrasive cleaning mantle 40 while the rearward cleaning roller 20 has a soft cleaning mantle 41 which acts more in a polishing way. In order to take into account the different structures of the cleaning rollers 10 and 20, and in order to correlate constructively different cleaning actions with the individual cleaning rollers 10, 20, the rotational speeds of the cleaning rollers 10 and 20 are

preferably different. This can be constructively realized in a simple way by pulleys 33, 34, and 34a of different diameters. In this connection, rotational speeds of approximately 4000/min up to 8000/min, in particular, 6000/min, are expedient.

As shown in particular in Figs. 6 and 7 in combination with Figs. 2 and 4, the axes of rotation 15, 25 of the cleaning rollers 10, 20 are positioned behind one another in the working direction and are approximately at the same height or level. The pivot axis 29 of the common support 9 is positioned in the space between the axis of rotation 15 and 25 of the cleaning rollers 10, 20. In a plan view according to Fig. 5, the axis of rotation 15 and 25 have the same spacing a to the pivot axis 29 of the common support 29.

As shown in the illustration of Fig. 4, the lower housing part 2 is divided in the working direction 4 by a partition 42. The partition 42 limits the working chamber 5 in a direction transverse to the working direction 4 and forms at the same time a wall portion of the drive chamber 17 at the side facing away from the working chamber 5. This drive chamber 17 containing the drive 16 in the form of an electric motor - compare Fig. 5 - is positioned approximately centrally between the sidewalls 38, 39 of the lower housing part 2. For cooling the electric motor 16, venting slots 55 are provided in the upper housing part 3 for supplying and removing cooling air.

On one longitudinal side of the lower housing part 2 a suction chamber 44 is formed between the drive chamber 17 and the outer side wall 38 which communicates in the illustrated embodiment via a suction socket 43 with a suction

fan, not illustrated. The suction socket 43 is arranged between the back wall 45 of the lower housing part 2 and the drive chamber 17.

Between the other sidewall 39 of the housing parts 2 and the drive chamber 17 a functional chamber 46 is arranged which is penetrated by the shaft 18 of the electric motor 16 and receives, for example, an electric on/off switch 47.

The suction chamber 44 communicates via suction channel 48 with a suction slot 50 (Fig. 8) which is arranged upstream of the cleaning roller 10 in the working direction 4 and which extends substantially over the entire width of the working chamber 5 and of the cleaning rollers 10 and 20, respectively. The suction slot 50 is separated from the working chamber 5 by a substantially vertical edge portion 90 of the channel bottom 49 wherein the edge portion 90 advantageously projects by an amount z in the direction toward the floor surface past the edge 91 of the end wall 52 leading in the working direction 4. The edge 91 forms the free rim of an edge portion 92 of the forward end wall 52. The edge portion 92 is angled relative to the end wall 52 and projects in the direction toward the vertical edge portion 90 of the channel bottom 49 so that the suction slot is delimited in this way. The course of the suction channel 48 is such that the channel bottom 49 surrounds the forward cleaning roller 10 with a part-circular section and extends above the cleaning rollers 10 and 20 to a suction opening 51 which is formed in the forward wall 52 of the upper housing part 3. The suction opening 51 is positioned in the area of the suction chamber 44 adjacent to the drive chamber 17 so that the suction

airflow, taken in through the suction slot 50, flows to the suction chamber 44 via the suction channel 48 and the suction opening 51 where it impacts on a baffle wall or deflector wall and is then guided into the suction socket 41. In order to be able to remove heavy objects that may have been sucked in, the suction chamber 44 has a closure lid 53 in the upper housing part 3 which allows access to the suction chamber 44 after removal of the closure lid 53. The suction channel 48 is open when the cover 6 is removed. The channel walls are thus defined by the channel bottom 49, the suction channel sidewalls 54, and the cover 6. Since the most narrow location of the suction channel 48 is the suction slot 50, all dirt particles, objects or the like entering through the suction slot 50 are transported without interruption at least into the suction chamber 44 from which they can be removed after removing the closure lid 53, if they have not been transported father via the suction socket 43.

In order to ensure for difficult cleaning situations an optimal cleaning of the floor covering, it is possible to provide in addition a spraying device 60 (Fig. 7) with which it is possible to moisten one of the cleaning rollers 10, 20, in the illustrated embodiment the cleaning roller 20. The spraying device 60 is expediently connected to a supply container which is exchangeably connected in the housing of the cleaning device.

The cleaning rollers 10, 20 are positioned so as to be easily exchangeable between the ends 13, 14 of the transverse supports 12. On the end facing away

from the drive connection, the base member 59 (Fig. 13) of each cleaning roller 10, 20 has a bearing pin 56 which is received in a bearing receptacle 57 (Fig. 9) on the transverse supports 12. On the oppositely positioned end 58 facing the drive connection (Fig. 11), the base member 59 is connected to a coupling module 35 which is illustrated in detail in Figs. 10 and 12.

The coupling module 35 supports on its side or end face facing away from the cleaning roller 10 a bearing pin 76 which is secured in a matching bearing receptacle of the transverse support 12 at the drive side. The coupling module 35 which is configured as a separate component is comprised advantageously of plastic material and has two drive wheels 33a, 34a which in the illustrated embodiment are configured as toothed pulleys. The drive wheels 33a, 34a are separated by a collar 71 from one another so that the belts resting thereon cannot rub against one another.

On the side or end face 70 facing away from the bearing pin 76 the coupling module 35 supports a central axle stump 72 which is surrounded by finger-like coupling elements 73. In the illustrated embodiment, as shown in Fig. 10, four coupling elements 73 are provided which are arranged equidistantly in the circumferential direction. The finger-like coupling elements 73 in the illustrated embodiment are formed as cylindrical pins which have a smaller axial length than the central axle stump 72.

Fig. 13 shows that complementary openings 82 and 83 are provided in the

end face 61 of the base member 59 of the driven end 58 of the cleaning roller 10. The coupling module 35 is axially pushed onto the base member 59 wherein first the axle stump 72 is inserted into the central opening 82. For an easier introduction, the end of the axle stump 72 is provided with a bezel. Since the axle stump 72 is axially longer than the cylindrical coupling elements 73, the introduction of the axle stump 72 into the central opening 82 can be realized without impairment by the coupling elements 73. Once the axle stump 72 is received in the central opening 82, the introduction of the coupling elements 73 into the matching coupling openings 83 is easily realized by rotating the coupling module 35 relative to the base member 59 until the coupling elements 73 snap into position in the openings 83. In this connection, the free ends of the coupling elements 73 are also provided with a bezel for easier introduction.

As illustrated in Fig. 11, between the drive wheel 34a neighboring the cleaning roller 10 and the end face 61 of the base member 59 a cover disk 74 is provided. The cover disk 74 is somewhat smaller than the maximum outer diameter of the cleaning roller 10 and is positioned at an axial spacing a relative to the neighboring drive wheel 34 a. As shown in Figs. 5 and 10, in the thus formed gap 75, the edge 85 of an opening in the partition 84 is positioned which separates the working chamber 5 from the belt chamber 31. The cover disk 74 covers the gap between the opening edge 85 of the partition 84 and the coupling module 35 substantially in a dust-tight way so that the belt chamber 31 is protected against

penetration of dirt.

Since the opening in the partition 84 is covered by the housing cover 6, it is easily possible to remove the cleaning rollers 10, 20 together with the coupling module 35 after removing the cover 6. When only the cleaning roller 10, 20 must be exchanged, the bearing pin 56 at the end of the cleaning roller facing away from the drive connection is detached from the bearing receptacle 57 (Fig. 9) and the cleaning roller is then removed axially from the coupling element 35.

The coupling element 35 connected with the first cleaning roller and the coupling element 35 connected with the second cleaning roller are identical parts so that, during assembly of the device as well as during later use by the customer, an exchange of the coupling modules, independent of the location, is easily possible without requiring special attention.

While specific embodiments of the invention have been shown and described in detail to illustrate the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.